

Claims

- [c1] A method for opening an integrated circuit fuse; the method comprising the steps of:
generating at least one opening to a fuse element that couples a plurality of terminals; and
wet etching the fuse element to open the fuse.
- [c2] The method of claim 1, wherein the generating step includes:
applying a photoresist to define an opening area for each opening; and
etching to generate the at least one opening.
- [c3] The method of claim 2, wherein the applying step includes:
depositing the photoresist;
exposing the photoresist using laser light; and
developing the photoresist to define the opening area for each opening.
- [c4] The method of claim 3, wherein the generating step further includes removing the photoresist and a diffusion barrier on the fuse element.
- [c5] The method of claim 1, wherein the generating step includes applying a polymer and ablating the polymer with a laser to define the at least one opening.
- [c6] The method of claim 1, wherein the fuse element is located in

a non-last metal layer.

- [c7] The method of claim 1, wherein the at least one opening includes one opening to each side of the plurality of terminals.
- [c8] The method of claim 7, wherein the wet etching step removes the fuse element under the plurality of terminals.
- [c9] The method of claim 1, wherein each terminal is fully-landed on a wire of the fuse element and includes a metal liner surrounding the terminal.
- [c10] The method of claim 1, wherein the fuse element and each terminal include copper.
- [c11] The method of claim 1, wherein the wet etchant includes at least one of sulfuric acid, aqueous ammonium persulfate, hydrogen peroxide and water.
- [c12] An integrated circuit fuse comprising:
a plurality of terminals coupled by a fuse element;
wherein the fuse element is located in a non-last metal layer.
- [c13] The integrated circuit fuse of claim 12, wherein the fuse element includes a wire and each terminal is fully-landed on the wire.
- [c14] The integrated circuit fuse of claim 12, wherein each terminal includes a metal liner.

- [c15] The integrated circuit fuse of claim 14, wherein the metal liner includes one of tantalum, tungsten and titanium nitride.
- [c16] The integrated circuit fuse of claim 12, wherein the fuse element and each terminal include copper.
- [c17] The integrated circuit fuse of claim 12, wherein each terminal includes a horizontal wire and a vertical stud, and the fuse element includes a wire that couples the vertical studs.
- [c18] The integrated circuit fuse of claim 12, wherein a first terminal includes a horizontal wire and a terminal vertical stud, a second terminal includes a horizontal wire, and the fuse element includes a wire coupled to the vertical stud and a fuse vertical stud coupled to the horizontal wire of the second terminal.
- [c19] An integrated circuit comprising:
a fuse including a plurality of terminals coupled by a fuse element;
wherein the fuse element is located in a non-last metal layer.
- [c20] The integrated circuit of claim 19, wherein each terminal is fully-landed on a wire of the fuse element.
- [c21] The integrated circuit of claim 19, wherein each terminal includes a metal liner.
- [c22] The integrated circuit of claim 21, wherein the metal liner

includes one of tantalum, tungsten and titanium nitride.

- [c23] The integrated circuit of claim 19, wherein the fuse element and each terminal include copper.
- [c24] The integrated circuit of claim 19, wherein each terminal includes a horizontal wire and a vertical stud, and the fuse element includes a wire that couples the vertical studs.
- [c25] The integrated circuit of claim 19, wherein the fuse element includes a horizontal wire coupled to a terminal vertical stud of a first terminal and a fuse vertical stud coupled to a horizontal wire of a second terminal.
- [c26] An integrated circuit fuse comprising:
a plurality of terminals coupled by a fuse element;
wherein each terminal is fully-landed on a wire of the fuse element.
- [c27] The integrated circuit fuse of claim 26, wherein each terminal includes a metal liner including one of tantalum, tungsten and titanium nitride.
- [c28] The integrated circuit fuse of claim 26, wherein each terminal includes a horizontal wire and a vertical stud, and the fuse element includes a wire that couples the vertical studs.
- [c29] The integrated circuit fuse of claim 26, wherein a first terminal includes a horizontal wire and a terminal vertical stud, a

second terminal includes a horizontal wire, and the fuse element includes a wire coupled to the vertical stud and a fuse vertical stud coupled to the horizontal wire of the second terminal.

[c30] An integrated circuit comprising:
an opened fuse area including a metal liner of a fuse element, the fuse element having been removed to generate the opened fuse area, the metal liner being intact immediately adjacent to, and in non-contact, with a plurality of terminals.